U. S. DEPARTMENT OF AGRICULTURE

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SPRING-SOWN RED OATS

SPRING-SOWN RED OATS primarily are grown in the area comprising the southern parts of Ohio, Indiana, and Illinois, southeastern Nebraska, Kentucky, Tennessee, Missouri, Arkansas, Kansas, Oklahoma, and northern Texas.

There are three rather definite groups of red-oat varieties, namely, Red Rustproof and its related strains, such as Ferguson No. 71 and Texas Red; Fulghum and related strains, such as Kanota and Frazier; and Burt. The Fulghum now occupies almost as much acreage as the Red Rustproof and Burt combined. It was originated about 25 years ago in Georgia as a plant selection from a field of Red Rustproof. The development and distribution of the Fulghum oat for spring seeding is largely responsible for the steady increase of the acreage of spring-sown red oats in the United States since 1919, especially in Kansas, Oklahoma, and Texas.

Red oats being descendants of the wild red oat originating in the region of the Mediterranean Sea, the cultivated red-oat varieties naturally are well adapted to the southern half of the United States. The extreme earliness of some of the red-oat varieties often enables them to escape, to some extent, injury by hot weather and drought.

The essentials for success in the production of red oats are—

Well-prepared land that is retentive of moisture and fairly fertile.
Good seed thoroughly cleaned and graded and treated for smut.
Early seeding with a grain drill.
Harvesting at the proper time.
Careful shocking and stacking to prevent injury by weathering.
Threshing when grain is thoroughly dry.

Directions for making the growing of oats more generally profitable are given in the following pages.

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SPRING-SOWN RED OATS

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CONTENTS

THE AREA

THE CENTRAL spring-sown red-oat area comprises the southern parts of Ohio, Indiana, and Illinois, southeastern Nebraska, Kentucky, Tennessee, Missouri, Arkansas, Oklahoma, and northern Texas. The southern border of this area, extending as far west as central Texas, is transitional between the winter-oat belt of the South and the great spring-oat section of the North. The designation "red-oat section" has resulted from the fact that in the western portion of this area, particularly in Kansas, Oklahoma, and Texas, red-oat varieties predominate to the extent that white (common) oat varieties are of only minor importance. For spring seeding, red-oat varieties also are grown almost exclusively in the winter-oat belt proper. The locations of the central spring-sown red-oat area and other more or less definite oat areas in the United States are shown in Figure 1.

IMPORTANCE AND DISTRIBUTION

The acreage devoted to spring-sown red oats in the United States has increased rather steadily. According to the census of 1919, about 8,000,000 acres of oats were grown in the principal red-oat producing States. This figure, of course, includes both the fall and spring sown acreages. Of this acreage it is estimated that at least 5,000,000 acres probably were devoted to spring-sown red oats. Since 1919 the acreage of spring-sown red oats has increased considerably, especially in Kansas, Oklahoma, and Texas. On the basis of the rate of increase current during the last few years, it is estimated that about 7,000,000 acres were sown to spring-sown red oats in 1927.

This decided increase in acreage in the States named can be attributed largely to the development and distribution of the Fulghum oat for spring seeding. The development and distribution of Fulghum during the last 10 years has had a most marked effect on the culture and production of oats in the United States. Fulghum and its various strains at present constitute one of the important varietal groups in this country.

As shown in Figure 1, the region in which spring-sown red oats have made the greatest advance is in the territory contiguous to the Ohio River and in Missouri, Kansas, Oklahoma, and Texas.

CLIMATIC ADAPTATION

Red or Red Rustproof oats are considered to be derivatives or descendants of the wild red oat (*Avena sterilis* L.) and to have originated in southern Europe in the region of the Mediterranean Sea.

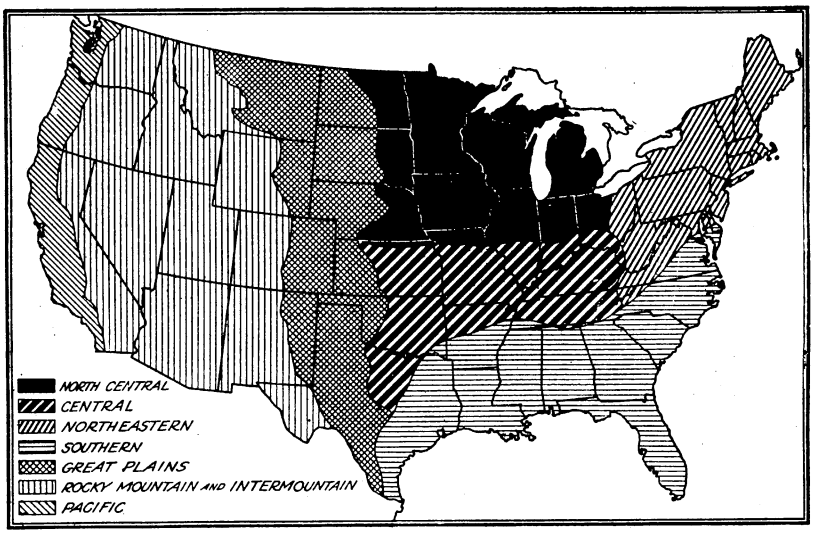

FIGURE 1.—Outline map of the United States, showing the general oat areas. In the southern and Pacific areas the crop is grown from both fall and spring seeding. In all other areas the crop is grown from spring seeding only. The southern area is known also as the winter-sown or fall-sown area. Likewise the central area is often designated as the spring-sown red-oat area

Red oats still may be found growing wild in that portion of Europe and in northern Africa. It is not surprising, therefore, that the cultivated red-oat varieties have proved to be so well adapted to the southern half of the United States.

Red oats are often referred to as "warm-climate oats." Their ability to withstand hot, dry weather, especially at heading and filling time, is widely recognized. Because of this ability to withstand heat during critical stages of development better than northern varieties, red oats long have been preferred for spring sowing in the Southeastern States. The ability to withstand heat also is responsible for increased use of Fulghum and its strains for spring sowing in the Southwestern States and in the southern part of the Corn Belt. In these sections hot weather often causes even the earliest of the north-

ern varieties to ripen prematurely, and the result is shriveled, poorly filled grain of light bushel weight. The extreme earliness of some of the red-oat varieties often enables them to escape, to some extent, injury by hot weather and drought.

SOILS

Oats will produce a satisfactory crop on almost any soil, provided it is well drained and contains sufficient available plant food. Oats do better on sandy soils than any of the small grains with the exception of rye. As a group, however, the loam soils are best for oats, owing to their ability to hold and furnish to the crop a greater quantity of water. This is desirable, as the water requirement of oats is higher than that of any other cereal crop.

Heavy, poorly drained clays or extremely rich soils subject to overflow are not well suited to oats. On soils too well supplied with plant nutrients, especially with nitrogen, serious losses may occur from lodging and plant diseases. In general, the soils in the spring-sown red-oat area, provided they are naturally well drained or have been artificially drained, meet the requirements of the oat crop. Their proper management with regard to rotation and cultural practices is sometimes of greater importance than soil fertility.

FERTILIZERS

The soil in the area in which spring-sown red oats are grown varies widely in fertility, and the price of fertilizer is subject to considerable fluctuation. For these reasons only general statements can be made regarding the kinds and the amounts of fertilizer to use. The plant nutrients in which soils are most often deficient are nitrogen, phosphorus, and potash. Some soils are deficient in lime and as a result are acid. Soils usually contain sufficient nitrogen and potash for oat production, and lime seldom is necessary, except on soils that are very sour. Many soils are deficient in phosphorus. Oats make their greatest withdrawal of plant food from the soil early in the season. During this time rather cool temperatures usually prevail, and the nitrifying bacteria, which are able to change the nitrogen-containing materials in the soil into a form usable by plants, are not very active. On poor soils the application of small quantities of readily available nitrogenous fertilizers at the time of seeding sometimes results in considerable profit. Oats intended for use as forage or hay will produce larger yields from heavier applications of manure or nitrogenous fertilizer.

It is seldom advisable to apply barnyard manure directly to oats, except on very poor soils. Ordinarily more satisfactory results are obtained by applying it to the previous row crop in the rotation, such as corn or cotton. Where manure is available for use on land intended for oats it should be applied during the fall and winter months and not immediately previous to seeding the oats.

Light applications of complete commercial fertilizers low in nitrogen may be applied directly to oats on most soils without danger of excessive straw growth. On sandy soils larger applications of commercial fertilizers relatively high in nitrogen may be applied directly without danger.

In the lower Ohio River Valley and in Missouri and Arkansas fertilizers formerly were not considered necessary for oats. However, experiments conducted in this part of the red-oat area indicate that commercial fertilizers may be applied to oats with favorable results. In the western part of the area, especially in Kansas, Oklahoma, and Texas, commercial fertilizers are as yet but little used on any crop, owing to the high native fertility of the soil.

When commercial fertilizers are used, the quantities of the different elements to apply and the methods of application depend largely on local conditions. A fertilizer mixture recommended for oats on heavy clay and loam soils contains 50 pounds of nitrate of soda and 150 pounds of superphosphate (acid phosphate). The mixture is applied at the rate of 200 pounds per acre. Experiments have shown that on sandy and gravelly soils increased yields often are obtained by the addition of 25 to 50 pounds of potash salts to the above-mentioned combination. On very poor soils the rate of application of this combination may be increased to 250 or 300 pounds per acre.

In Arkansas a complete fertilizer containing nitrogen, phosphorus, and potash applied with lime has given best results. Where fertilizers are needed, from 150 to 200 pounds of superphosphate (acid phosphate) is one of the most effective single fertilizer treatments for oats. Applications of superphosphate (acid phosphate) not in excess of 200 to 250 pounds to the acre usually are more effective than heavier ones.

ROTATIONS

For best results, spring oats must be sown as early as practicable. Oats should follow a crop that leaves the soil in a condition that permits it to be prepared quickly in the spring. Generally oats follow corn very successfully. Corn ground can be prepared for oats by disking and harrowing. Oat land is considered good for wheat. The oat crop is harvested early, permitting the early plowing so advantageous for wheat. Grass or clover usually is sown with oats or wheat. In the northern portion of the spring-sown red-oat section a popular rotation is corn for two years, followed by oats and wheat each for one year, and clover and timothy for two years. In this rotation wheat serves as a nurse crop, the timothy being sown with the wheat in the fall and the clover the next spring. If wheat is omitted, oats serve as the nurse crop for clover and timothy, but the position of the oats in the rotation usually is the same.

In the more southern part of the area where spring-sown red oats are grown, cotton is the important cash crop. One rotation including oats in this section consists of corn with cowpeas sown between the rows the first year, followed by oats the second year, with cowpeas sown in the stubble as soon as the oats are removed and cotton following the cowpeas the third year.

It is impossible to devise one rotation suitable for all conditions. Each farmer must take into consideration the fertility of his soil and the adaptation of the different crops and returns therefrom in choosing the rotation he will follow.

PREPARING THE SEED BED

Oats generally follow corn or other row crop in the rotation. Corn, being a cultivated crop, leaves the ground in comparatively good condition for oats. Also it usually is off the ground early in the winter, permitting early soil preparation and seeding of oats in the spring. To prepare a good seed bed following corn, the ground is usually disked twice to break up the soil held by the corn roots. If cornstalks have been left standing, it is good practice to break the stalks before disking. This can be done by dragging a heavy pole or an iron rail broadside across the field when the ground is frozen. A common practice is to hitch a team of horses to each end of a steel rail, dragging it across the field. Cornstalks snap off close to the

FIGURE 2.—Preparing a seed bed for spring-sown red oats on stubble land by the use of a disk and a spike-tooth harrow

ground much more readily when the weather is cold than when it is warm.

Disks should be sharp in order successfully to cut the stalks. It is unnecessary and inadvisable to rake and burn the stalks, as to do so results in loss of organic matter. In the western portion of the area where spring-sown red oats are grown, soil blowing is a factor, and the surface litter and organic matter supplied by the stalks tends to reduce soil blowing to some extent. Oats usually give the best results if the seed bed is rather firm beneath and has from 2 to 3 inches of loose, mellow soil on the surface. Such a seed bed ordinarily can be obtained by disking the field twice. It usually is best to "lap disk" rather than to cross disk a field. This keeps the surface more nearly level. The disks should be set to cut the soil only 3 or 4 inches deep. After the soil is disked it should be smoothed with a spike-tooth harrow. A disk harrow in operation is shown in Figure 2.

Land seldom is plowed for oats in the northern part of the spring-sown red-oat area. Plowing usually is unnecessary, as it consumes too much time, loosens the soil too much, and often prevents the early seeding of the oats, which is desirable. Soil blowing and erosion also are more likely to occur if the ground is plowed.

If grass, clover, or alfalfa are to be sown with the oats, the soil may be fall plowed and prepared for spring seeding by double disking and smoothing with a spike-tooth harrow. Where soil blowing may occur or there is danger of the soil puddling during the winter, fall plowing may not be advisable.

SEED PREPARATION

SCREENING AND FANNING

Clean seed is essential if oats are to be free from weeds. Oat seed ordinarily should be screened or run through a fanning mill. This removes the light oats and much of the dirt, trash, and weed seed. The trash should be removed in order to facilitate the perfect operation of the drill or seeder. Light oats are not likely to germinate if sown, and weed seed should be removed to prevent the spreading of noxious weeds. Fanning also removes some smut spores from the seed, decreasing smut infection to that extent.

TREATING FOR SMUT[1]

Smut infection in oats annually causes material losses. (Fig. 3.) At present the best means of controlling smuts of oats is by the use of formaldehyde, which may be applied by spraying, sprinkling, or dipping the seed. In all methods 1 pound of formaldehyde is used to each 50 bushels of oats. If fewer bushels of seed are to be treated, make up a correspondingly smaller quantity of solution. The methods differ only in the quantity of water used and the manner of applying the solution. Regardless of the method used, the seed should be thoroughly fanned and screened before it is treated.

DIRECTIONS FOR SPRAY METHOD

Add 1 pint of formaldehyde to 1 pint of water. This is sufficient for 50 bushels. Put the quart of solution in a hand sprayer (not a sprinkler) and spray the oats while shoveling them from one pile to another. Cover the treated pile with clean sacks or canvas for at least five hours or overnight. Then sow immediately or spread out to aerate.

DIRECTIONS FOR SPRINKLE METHOD

Add 1 pint of formaldehyde to 40 gallons of water. This quantity is sufficient to treat 50 bushels. Spread the grain to be treated in a layer on a clean granary floor or on canvas. Apply the formaldehyde solution from a sprinkling can while the seed is being turned with a shovel. After treatment shovel the grain into a pile and cover with clean sacks or canvas for at least five hours or overnight. Then sow immediately or spread out to dry.

DIRECTIONS FOR DIP METHOD

Add 1 pint of formaldehyde to 40 gallons of water. This quantity is sufficient to treat 50 bushels. Put the seed in loosely woven burlap or gunny sacks. These should be only half filled and tied at the top. Successively dip the grain

[1] Prepared under the direction of V. F. Tapke, pathologist, Office of Cereal Crops and Diseases.

in this solution and drain until the seed is thoroughly wet. Remove the sacks from the solution and let them stand at least two hours or overnight. Then sow immediately or spread out to dry.

The treated grain should not be allowed to come in contact with bags, bins, or machinery in which there may be smut spores. To

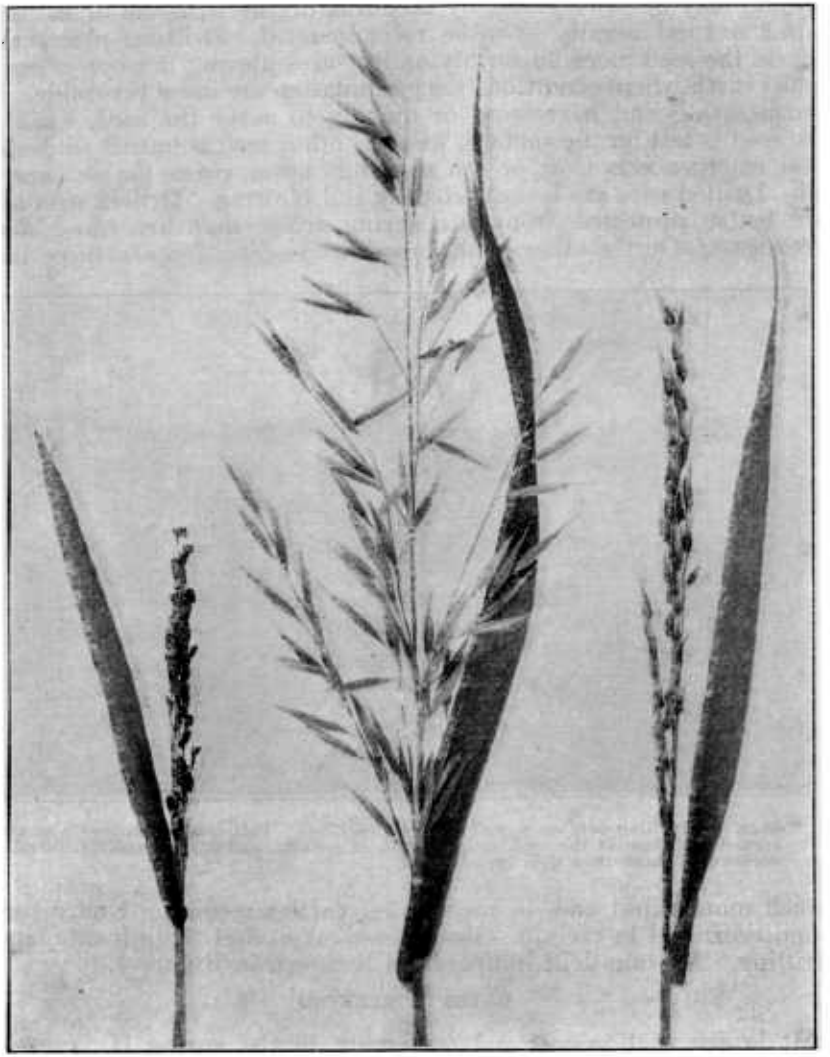

FIGURE 3.—Healthy and smutted panicles of oats. Loose smut at left, covered smut at right

avoid danger of reinfection, all containers should be sprayed with the formaldehyde solution before being used for the treated grain.

Surplus treated grain may be fed to farm stock without injurious results, provided it is thoroughly dry and has been exposed to the air for a few days.

For more detailed directions the reader is referred to Miscellaneous Publication No. 21 of the United States Department of Agriculture.[2]

SOWING THE SEED

SEEDING METHODS

Oats may be sown either by broadcasting or with the drill. The latter method usually is to be recommended. Drilling places and covers the seed more uniformly and insures placing it more often in moist earth where conditions for germination are more favorable. In broadcasting and harrowing or disking to cover the seed, some of the seed is left on the surface, whereas other seed is buried so deeply that emergence is slow or the seedlings never reach the surface at all. Drilled oats are less affected by soil blowing. Drilled oats also are better protected from late spring frosts than are those sown broadcast. On the other hand, broadcast seeding frequently permits

FIGURE 4.—Drilling oats on a well-prepared seed bed. This method insures a more even distribution of the seed, proper depth of seeding, and a more uniform germination and stand than does broadcasting

much more rapid and, in some cases, earlier seeding. Under some conditions and in certain seasons these may offset the advantages of drilling. A grain drill in operation is shown in Figure 4.

DATES OF SEEDING

It is essential to sow red oats early in the spring if favorable results are to be obtained. Early seeding often is as important as good soil preparation. The danger of loss from late seeding usually is greater than that by freezing from seeding too early. The area in which spring-sown red oats are grown extends over so wide a territory that only general recommendations on seeding dates can be made. In Texas, Arkansas, Oklahoma, and southern Missouri red oats can be sown much earlier in the spring than farther north. In the

[2] TAPKE, V. F. FORMALDEHYDE SEED TREATMENT FOR OAT SMUTS. U. S. Dept. Agr. Misc. Pub. 21, 4 pp., illus. 1928.

southern part of the spring-sown red-oat territory seeding may be done in February, climatic and soil conditions being favorable. Farther north the seeding date is later. The Missouri Agricultural Experiment Station recommends seeding oats prior to March 15. As a rule, spring-sown red oats should be sown before March 15 in Kansas and the southern parts of Nebraska, Illinois, Indiana, and Ohio. Climatic conditions being favorable, early seeding for spring-sown red oats can hardly be emphasized too strongly.

RATES OF SEEDING

The rate at which oats should be sown varies with locality, condition of the soil, method of seeding, and kernel size. On soils foul with weeds more seed should be used than on clean soil. About one-fourth less seed is required when drilled than when sown broadcast. Most of the red-oat varieties have comparatively large kernels and therefore should be sown at heavier rates than the smaller kerneled northern varieties, such as Kherson and Sixty-Day. Many experiments have been conducted to determine the best rate of seeding oats. The results of these experiments show that tillering smooths out differences in numbers of plants per acre. In thin stands more tillering occurs than in thick stands. The best seeding rate depends on so many factors, some of which are seasonal, that it is not advisable to make specific recommendations. Most oats are sown at rates varying from 8 to 12 pecks per acre, the average for the red-oat section probably being about 10 pecks. The Red Rustproof variety, owing to its large kernels, should be sown at rates from 1 to 2 pecks greater than Fulghum and Burt.

CULTIVATION

Oats sometimes are harrowed after the plants are well through the ground, to destroy the weed growth. Where a large number of small weeds appear after the oat plants have become established and before the oats shade the soil, many of the weeds may be destroyed by a light harrowing. To prevent the harrow from damaging the crop, the teeth should be set to slant backward so as to stir a minimum amount of soil, yet to destroy the maximum number of small weeds. Such practices are only partially successful and are usually impracticable, weeds being better controlled by rotation and by cultivation previous to seeding.

Some farmers remove large weeds from their oat fields by pulling or cutting with hoe, shovel, or knife. Some oats are tramped down in such operations, but the grain lost in this way probably is more than compensated for by the eradication of the weeds and the prevention of their seeding. Spraying with iron sulphate, sodium arsenite, and other chemicals to kill weeds in oats is sometimes recommended, but this method of eradication has not proved practicable and has not come into general use.

HARVESTING THE CROP

CUTTING

Binding is the usual method for harvesting oats in most of the spring-sown red-oat area. In the extreme western portions of this

area some fields are cut with the header and a few with the combined harvester-thresher. Fields of oats which are extremely short, because of heat and drought, are cut with the mower. Mowing also is necessary sometimes where the oats have lodged to a considerable extent. If handled in this way, the crop is raked into windrows and later placed in cocks. When mowed, oats should be cut before becoming too ripe, or a considerable portion of the grain will be lost through shattering.

The best time to cut oats depends on the method of harvest. If the grain is cut with the binder it is best to start very shortly after the grain reaches the hard-dough stage. If the header is used, oats should be cut while in the hard-dough stage. When the combined

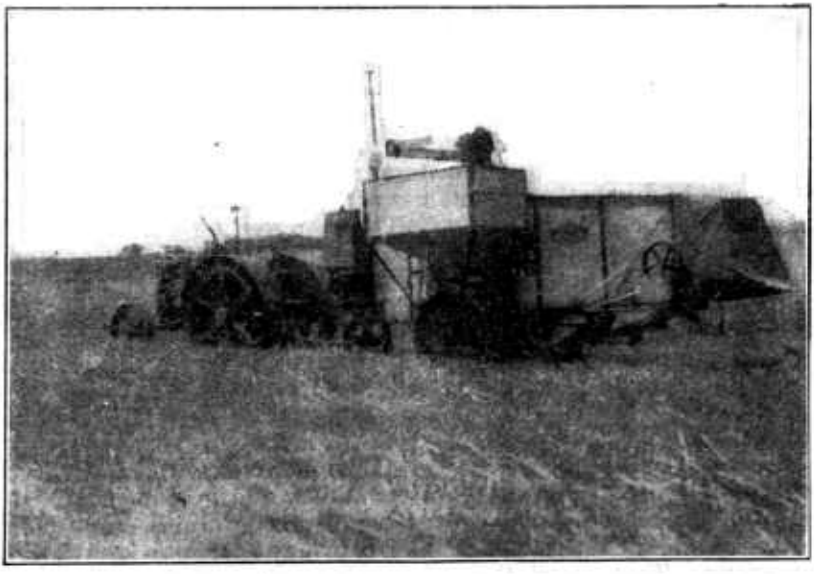

FIGURE 5.—One type of combined harvester-thresher used in harvesting oats

harvester-thresher is used the oats should be allowed to stand until fully ripe, so that the grain can be stored without danger of loss from heating and molding in the bin. A combined harvester-thresher in operation is shown in Figure 5.

SHOCKING

When oats are cut a little green because the straw is desired for roughage or to avoid damage by storms, etc., they may mold if shocked at once. If allowed to dry somewhat in the bundle, danger from shocking too green is lessened. If the grain is cut when in the hard-dough stage it may be shocked at once without danger.

In shocking oats, two types of shocks, the long and the round, may be used. Many farmers use the round type exclusively, while others prefer the long type of shock. If the grain becomes wet after it is cut and before it is shocked, it will dry out more quickly if shocked in long shocks. If capped properly, long shocks will protect the grain from moisture almost as well as the round shocks. Usually

round shocks offer more protection from the weather, however. In sections where winds are prevalent shocks are seldom capped, as cap bundles are likely to be blown off and injured as a result of lying on the ground.

Shocking Kanota oats after the grain binder in Kansas is shown in Figure 6. A "close-up" view of a well-built round shock is shown in Figure 7.

STACKING

A large portion of the oat crop never is stacked, but is threshed directly from the shock. However, many farmers prefer to stack their oats and thresh them at their convenience. It is essential that the stack be properly built. If the stack is not well built the grain had better be left in the shock. In building the stack it is well to start it on a framework of posts or rails. These should be arranged

FIGURE 6.—Harvesting Kanota oats in Kansas

on the ground in such a manner as to prevent the oats from coming in contact with the soil. This will prevent absorption of moisture from the ground and will allow the air to penetrate beneath the stack.

Round stacks are more popular than long ricks, but the shape of the stack is immaterial so long as it is properly constructed and turns water.

To build a round stack, set up two bundles precisely as in starting to build a shock; then add bundles to the shock, placing each one a little flatter until a basal diameter of 10 to 12 feet is attained. Lay all bundles with the butts outward. The stacker progresses either to the right or the left, and the pitcher places the bundles with butts to the front at the point most convenient to the stacker.

Start the second layer by placing a row of bundles around the outer edge. The second row of bundles should be laid with the butts extending just past the bands of the outer row of bundles, overlap-

ping each successive row a little more than the preceding one. When the center of the stack is reached the builder will start again at the outside and proceed similarly with the third layer.

As shocked bundles have a rather slanting butt, lay the successive outer rows with the long side of the bundle up and extending slightly beyond the layer beneath. The diameter is gradually increased in this manner until a height of 7 or 8 feet is reached. This gradual enlargement of the stack forms the bulge. To reduce danger of slipping while building the bulge, the so-called double-row or triple-row courses of bundles may be laid. Instead of laying a single row at a time, a course containing two or three rows is laid at each successive round.

The center of the stack always should be kept well tramped, solid, free from holes, and higher than the rim. The outer rows,

FIGURE 7.—A well-built round shock of oats with a cap sheaf

however, should be tramped as little as possible, so that when the stack settles the straws in the exposed butts will slope downward and thus prevent water from running into the stack.

After the bulge is built the diameter is slightly decreased with each layer, the stack thus tapering gradually to a point. This is best done by laying the bundles with the short side of the sloping butts up, which decreases the diameter with each successive layer and gives about the desired slope and smoothness to the stack. As a rule, one row of bundles is laid at a time in topping out the stack, as the drawing-in process greatly lessens the danger of slipping. It is very important in building the top of the stack that the center be kept well filled and solid, and higher than the outside. This is conveniently done by overlapping each successive row a little more in progressing toward the center of the stack. The middle also may be kept more solid by laying some of the inside bundles with the heads pointing toward the outside of the stack.

The top bundles of the stack should be put on like those of a cap for a shock. These may be held in place by driving a sharpened stake 6 to 8 feet long down into the center. Weights made of two light timbers tied together with rope or wire also may be hung across the top of the stack to keep the top bundles in place. If desired, stacks also may be thatched with straw or hay, or even covered with tarpaulins.

Long stacks or ricks are built similarly. However, greater skill is required in building this type of stack, for which reason the smaller round stack usually is preferable.

In stacking mowed or headed oats, the stacks should be started on a well-drained plot of ground. It is well to cover the ground with rails and straw, just as when stacking bundle grain. Headed grain usually is stacked in rather long, narrow stacks, sharply pointed or topped to prevent water from entering and damaging the grain. They should be covered or thatched with straw or hay to prevent rain from gaining entrance. The stacks should not be made too large; from 14 to 16 feet at the greatest diameter of the bulge is about the proper size, as the grain contains some moisture when cut, and it may be injured by heating too much during the "sweat" if the stacks are too large. Care should be taken to stake or weight securely the tops of the stacks, to prevent the wind from blowing them off.

THRESHING

Oats thresh more easily than any of the other cereals. The grain should be thoroughly dry before it is threshed. If not dry, both the grain and the straw are likely to mold, the threshing operation is less efficiently performed, and there is greater likelihood of machinery troubles than if the grain is dry.

The thresher should be thoroughly cleaned before starting to thresh, to avoid mixture of varieties and to prevent the scattering of noxious weeds from farm to farm by the machine. The separator should be watched carefully to see that it is working properly. The grain should be threshed free from the straw; yet the concaves of the machine should not be set so close to the cylinder as to cut the hulls from the kernels. Oat straw generally is considered superior to that of any of the other cereals as roughage for cattle and other livestock. If room is available it is both economical and convenient to run the oat straw into the barn when threshing. Otherwise the value of the straw well repays careful stacking.

In recent years some oats have been threshed by the combined harvester-thresher. If the combine is used in threshing the oats, the grain should be fully ripe before starting the combine. If cut too green it is likely to be injured by molding in the bin. On the other hand, if allowed to remain standing until overripe, considerable loss may result from shattering and from heads breaking over. If the straw is to be used it may be dumped in windrows from a straw buncher attached to the combine. It is then picked up from the dumps and handled as desired.

RED-OAT VARIETIES

At the present time three rather definite groups of red-oat varieties are being grown from spring seeding. These are the Red Rustproof and its related strains, such as Ferguson No. 71 and Texas

Red; Fulghum and related strains, such as Kanota and Frazier; and Burt. Formerly Red Rustproof was the leading spring-sown red oat, followed by Burt. At the present time Fulghum occupies almost as much acreage as the other two varieties combined. The Burt oat has lost favor very rapidly, Fulghum being better adapted to most of the territory where Burt formerly was grown. Fulghum usually outyields Burt, but the greater uniformity and better quality of grain of the former has been mostly responsible for the great shift from Burt to Fulghum. The Red Rustproof is larger and later maturing than either Burt or Fulghum. Fulghum and Burt are both very early, and the former especially is adapted to the northern part of the red-oat area. Burt is grown in no definite part of the red-oat territory at the present time. It once was popular in parts of Missouri, but it seems likely that ultimately it will be supplanted by Fulghum everywhere. Panicles and spikelets of Red Rustproof and Fulghum varieties are shown in Figure 8. Spikelets and florets of these varieties, and of Burt also, are shown in Figure 9.

RED RUSTPROOF

The straw of the Red Rustproof variety is of midheight, fine or of midcoarseness, straight and stiff, and of the reddish color characteristic of all so-called red oats. The panicles are small to midsized with rather ascending branches. The kernels are large and plump and of a reddish brown color. Both kernels of the spikelet usually are awned. In most of the spring-sown red-oat area Red Rustproof ripens as a mid-season or late variety, and it usually is relatively free from smut. There are several named strains. The one best known in this area is Red Texas or Texas Red (also called Texas Rustproof and Texas Red Rustproof). Ferguson No. 71, Ferguson No. 922, and Nortex are selected strains which have been bred for both fall and spring seeding. There are other named strains, such as Appler, Bancroft, Cook, Hasting (Hundred Bushel), and Patterson, but these strains are grown mostly from fall seeding in the winter-oat belt of the Southeastern States. In California the Red Rustproof oat is most commonly grown under the name of California Red.

Ferguson No. 71 and Ferguson No. 922 were developed and distributed by the Ferguson Seed farms, Sherman, Tex. They were originated as plant selections from the Red Rustproof oat. These strains are uniform in plant and kernel characters, are of high-yielding ability, and are especially recommended for northern Texas.

Nortex (Texas No. 9235, Reg. No. 67 [3]) was developed from a plant selection at Substation No. 6, Denton, Tex. Nortex is uniform, high yielding, and of special promise in the experiments conducted at Denton, Tex., from both fall and spring seeding.

The Red Rustproof oat, as represented by these strains and as a spring-sown type, is of much less importance than formerly. As noted above, it is being replaced by strains of Fulghum. The earliness and high-yielding ability of the latter are greatly preferable to the late-maturing and larger size of the Red Rustproof strains.

The Red Rustproof as commonly grown has been a mixture of strains. Much of the commercial seed of Red Rustproof also con-

[3] Registration number of the American Society of Agronomy and the Bureau of Plant Industry.

tains admixtures of black and yellow oats. It has been demonstrated, however, that uniform, high-yielding strains of Red Rustproof can be maintained by careful roguing and handling of the seed. Where Red Rustproof or its strains are still grown, farmers

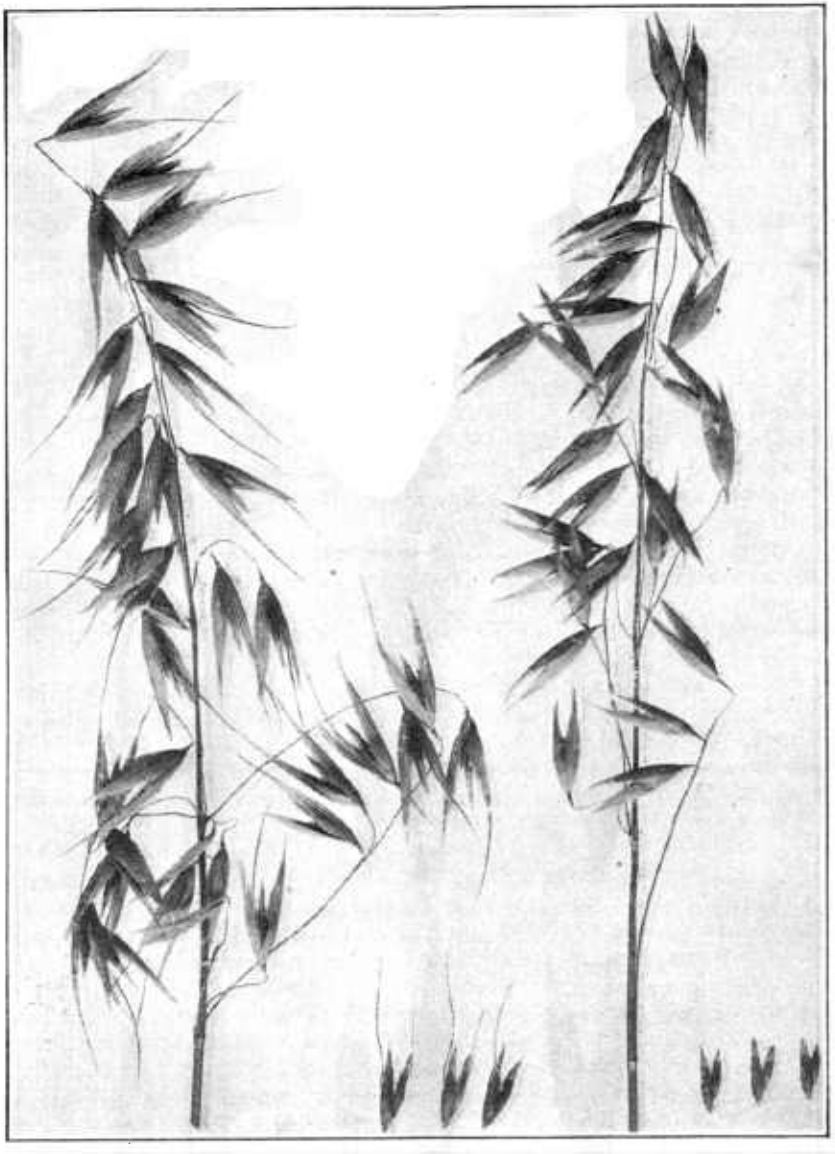

FIGURE 8.—Panicles and spikelets of Red Rustproof (left) and Fulghum (right) oats

are advised to obtain seed of strains that have been purified by selection.

The distribution of the Red Rustproof variety in 1919, both fall sown and spring sown, is shown in Figure 10. This map also serves

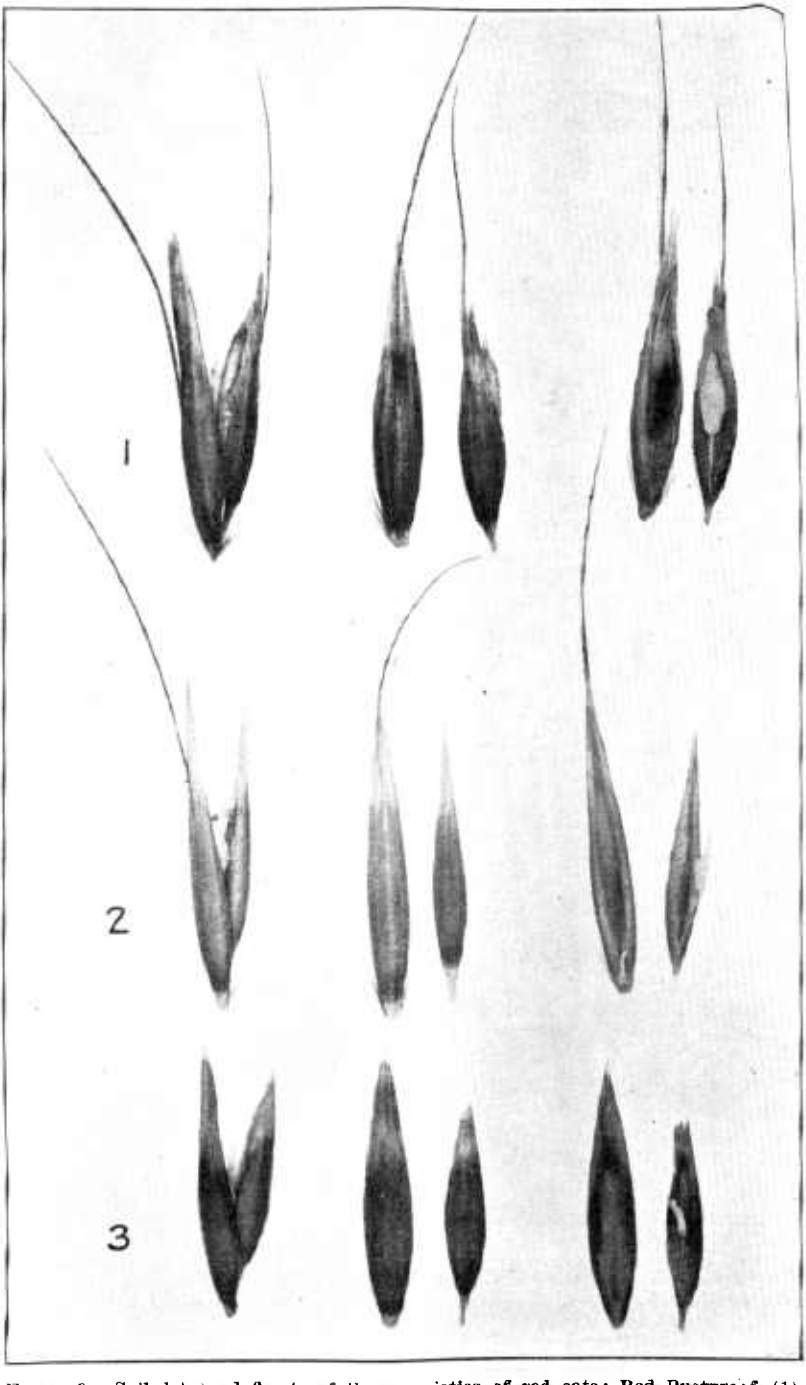

FIGURE 9.—Spikelets and florets of three varieties of red oats: Red Rustproof (1), Burnt (2), Fulghum (3)

to emphasize the importance of red oats in Missouri, Kansas, Oklahoma, and Texas. A field of Red Rustproof oats is shown in Figure 11.

FULGHUM

Fulghum, without doubt, is one of the most important oat varieties that have been developed in North America. It was originated about 25 years ago in southeastern Georgia as a plant selection from a field of Red Rustproof oats. It probably resulted from a natural hybrid. It first came into prominence in that section of the country as a fall-sown variety. Its possibilities as a spring-sown variety were first discovered about 10 years ago by the Kansas Agricultural Experiment Station, where a strain later named Kanota showed unusual promise in the experiments conducted at that station. It was

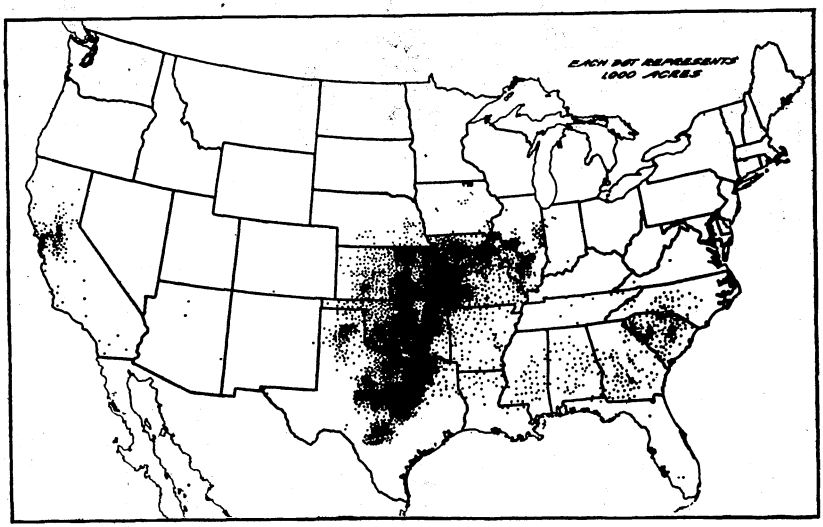

FIGURE 10.—Outline map of the United States, showing the distribution of Red Rustproof oats in 1919. Since 1919 a considerable portion of this acreage has been occupied by Fulghum and Kanota.

first distributed to farmers of Kansas in 1919 and at once became popular. In 1926 it was estimated that Kanota was grown on about 1,000,000 acres in Kansas alone. A field of Kanota oats in shock in Kansas is shown in Figure 12.

Fulghum differs from Red Rustproof in growing a little taller and in producing more slender kernels with fewer awns and basal hairs. It ripens a week to ten days earlier than Red Rustproof. Fulghum is susceptible to crown rust.

The leading strain of the Fulghum variety is Kanota (Reg. No. 66), which, when spring sown, may produce better yields than the original Fulghum. Kanota is now grown to some extent in the southern parts of Ohio, Indiana, and Illinois, rather extensively in Missouri, Oklahoma, and Texas, and (as already noted) very extensively in Kansas.

Another strain of Fulghum is Frazier, which was developed at Substation No. 6, Denton, Tex., as a spring-sown variety for that section. Frazier is similar to the original Fulghum oat, but usually

produces more awns than the latter. Frequently both kernels of the Frazier spikelet carry awns.

BURT

Burt is said to have originated in Greene County, Ala., in 1878. A Mr. Burt made the selection from a field of Red Rustproof oats

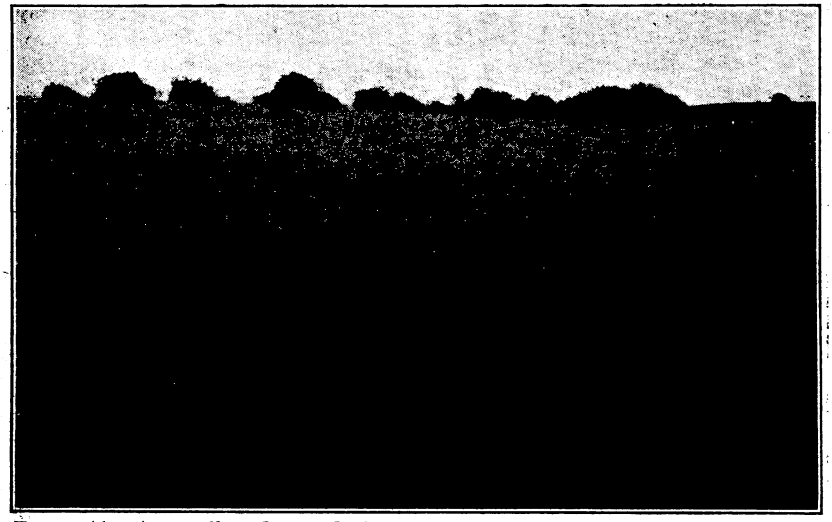

FIGURE 11.—An excellent field of Red Rustproof oats in the spring-sown red-oat area

because of its early maturity. Burt usually grows taller than either Red Rustproof or Fulghum. It differs from Fulghum in being earlier, less uniform, and having a longer and much more slender kernel. Its lack of uniformity in plant and kernel characters are

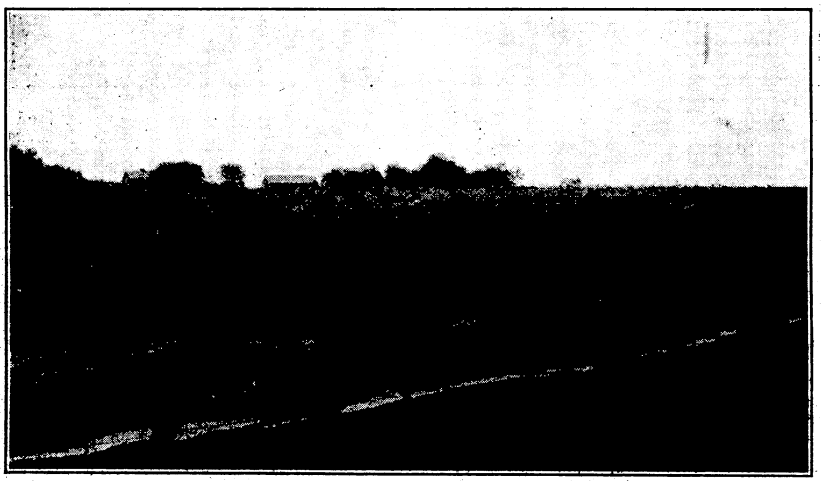

FIGURE 12.—A field of Kanota oats in shock in Kansas

undesirable. Burt also is known under the names of Early May, June, and Fourth of July. The variety can not be recommended for any particular district. Burt should be grown only where an oat still earlier than Fulghum is desired.

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